WHAT IS CLAIMED:

1. A method for estimating the grade of service (GoS) and offered traffic for voice over internet protocol (VoIP) calls at a gateway bridging calls between a public switched telephone network and an internet protocol network, the gateway having a dial-control management information base, the method comprising the steps of:

periodically polling a dial-control management information base for dial peer traffic statistics;

storing the polled data;

estimating the carried traffic using the polled data;

estimating the grade of service by utilizing the Erlang-B formula in an inverse manner, operating on the estimated carried traffic obtained in the first estimating step; and

estimating the offered traffic using the estimated values for the carried traffic and the grade of service obtained in the previous estimation steps.

2. The method of claim 1 where on the IP side of the gateway the call is carried over real time protocol/user datagram protocol which is encapsulated in internet protocol packets.

3. The method of claim 1 where on the public switched telephone network side of the gateway there are typically two or four ISDN

primary rate interfaces, where each primary rate interface is typically configured to support 23 B channels.

4. The method of claim 1 where the dial-control management information base is standardized as per RFC 2128, and where the dial peer traffic statistics obtained in the polling step comprise at least dialCtlPeerConnectTime and dialCtlPeerStatsSuccessCalls as defined in said standard.

5. The method of claim 4 where:

the carried traffic is estimated using the following equation:

$$C = \sum_{i \epsilon I} \delta(i)(CT(i,b) - CT(i,a)) / (b-a),$$

where, for each dial peer i, CT(i,b) is the value of dialCtlPeerConnectTime for dial peer i at time b, CT(i,a) is the value of dialCtlPeerConnectTime for dial peer i at time a, and *(i) = 1 if dial-peer i is a dial-peer on the public switched telephone network side of the gateway, *(i) = 0 if the dial-peer is on the internet protocol side of the gateway, and C is the summation over all dial peers, giving the total carried traffic for the gateway.

6. The method of claim 5, where:

the grade of service seen by the offered traffic in the time interval (a,b) is given by grade of service = Erlang(B, C/(1-G*)), where B is the total number of ISDN B channels on the public switched telephone network side of the gateway, Erlang() is the Erlang-B formula, and G* is a solution of the

equation G* = Erlang(B, C /(1-G)) subject to the condition that 0<G*<1, and the offered traffic is estimated as $\Delta = C/(1-G^*)$ in the time interval (a,b).

7. The method of claim 5 where G* is found using numerical methods, and the Erlang-B formula is computed using the following well-known recursion formula:

$$\text{Erlang}(B, \Delta) = \Delta\text{Erlang}(B-1,\Delta) /(B+\Delta\ \text{Erlang}(B-1,\Delta)),$$

with the initial condition set such that Erlang(0,Δ) = 1.

8. An apparatus for estimating the grade of service and offered traffic for voice over internet protocol calls at a gateway bridging calls between a public switched telephone network and an internet protocol network, where the gateway has a dial-control management information base, the apparatus comprising:

means for periodically polling the dial control of the management information base for dial peer traffic statistics;

means for storing the polled data;

a first estimating means for estimating the carried traffic using the polled data;

a second estimating means for estimating the grade of service by utilizing the Erlang-B formula in an inverse manner operating on the carried traffic result from the first estimating means;

a third estimating means for estimating the offered traffic using the estimated values for the carried traffic and the grade of service obtained by the first and second estimation means; and

means for numerical calculation for processing numerical data needed by each of the first, second and third estimation means.

9. The apparatus of claim 8 where on the internet protocol side of the gateway the call is carried over real time protocol/user datagram protocol which is encapsulated in internet protocol packets.

10. The apparatus of claim 8 where on the public switched telephone network side of the gateway there are two or four ISDN primary rate interfaces, where each primary rate interface is typically configured to support 23 B channels.

11. The apparatus of Claim 8 where the dial-control management information base is standardized as per the standard described in the Internet Engineering Task Force (IETF) Request for Comment (RFC) 2128, and where the dial peer traffic statistics obtained by the means for polling comprise at least the dialCtlPeerConnectTime and dialCtlPeerStatsSuccessCalls as defined in said standard.

12. The apparatus of Claim 11 where:

the carried traffic is estimated by the first estimating means using the following equation:

$$C = \sum_{i \in I} \delta(i)(CT(i,b) - CT(i,a)) / (b-a),$$

where CT(i,b) is the value of dialCtlPeerConnectTime for dial peer i at time b, CT(i,a) is the value of dialCtlPeerConnectTime for dial peer i at time a, and *(i) = 1 if dial-peer i is a dial-peer on the PSTN side of the gateway, and *(i) = 0 if the dial-peer is on the IP side of the gateway, and I is the set of all dial peers at the gateway;

the estimate made by the second estimating means of the GoS seen by the offered traffic in the time interval (a,b) is given by solving the equation GoS = Erlang(B, C/(1-G*)), wherein B is the total number of ISDN B channels on the public switched telephone network side of the gateway, Erlang() is the Erlang-B formula, and G* is a solution of the equation G* = Erlang(B, C/(1-G*)) subject to the condition that $0 < G^* < 1$, wherein said solution G* is generated by the means for numerical calculation; and

the offered traffic is estimated by the third estimating means to be $\Delta = C/(1-G^*)$ in the time interval (a,b).

13. The apparatus of Claim 12 where the nonlinear equation solution G* is found by the means for numerical calculation using numerical methods, and the Erlang-B formula is computed by the means for numerical calculation using the following well known recursion formula:

$$\text{Erlang}(B, \Delta) = \Delta\text{Erlang}(B-1,\Delta) / (B+\Delta\ \text{Erlang}(B-1,\Delta)),$$

with the initial condition set such that Erlang(0,Δ) = 1.

14. Computer executable code stored on one or more computer readable media, the code for estimating the grade of service and offered traffic for voice over internet protocol calls at a gateway bridging calls between a public switched telephone network and an internet protocol network, where said gateway has a dial-control management information base, the code comprising code to cause the performance of the steps of:

periodically polling the dial control of the management information base for dial peer traffic statistics;

storing the polled data;

estimating the carried traffic using the polled data;

estimating the grade of service by utilizing the Erlang-B formula in an inverse manner operating on the estimated carried traffic obtained in the first estimating step, and the number of channels on the public switched telephone network side of the gateway; and

estimating the offered traffic using the estimated values for the carried traffic and the grade of service obtained in the previous estimation steps.

15. The computer executable code of claim 14 where on the internet protocol side of the gateway the call is carried over real time protocol/user datagram protocol which is encapsulated in internet protocol packets.

16. The computer executable code of claim 14 where on the public switched telephone network side of the gateway there are typically two or four ISDN primary rate interfaces, where each primary rate interface is typically configured to support 23 B channels.

17. The computer executable code of claim 14 where the dial-control management information base is standardized as per RFC 2128, and where the dial peer traffic statistics obtained in the polling step comprise at least dialCtlPeerConnectTime and dialCtlPeerStatsSuccessCalls as defined in said standard.

18. The computer executable code of claim 14 where:

the carried traffic is estimated using the following equation:

$$C = \sum_{i \varepsilon I} \delta(i)(CT(i,b) - CT(i,a)) / (b-a),$$

where, for each dial peer i, CT(i,b) is the value of dialCtlPeerConnectTime for dial peer i at time b, CT(i,a) is the value of dialCtlPeerConnectTime for dial peer i at time a, and *(i) = 1 if dial-peer i is a dial-peer on the public switched telephone network side of the gateway, *(i) = 0 if the dial-peer is on the internet protocol side of the gateway, and C is the summation over all dial peers, giving the total carried traffic for the gateway.

19. The computer executable code of claim 14, where:

the grade of service seen by the offered traffic in the time interval (a,b) is given by grade of service = Erlang(B, C/(1-G*)), where B is the total

number of ISDN B channels on the public switched telephone network side of the gateway, Erlang() is the Erlang-B formula, and G* is a solution of the equation G* = Erlang(B, C /(1-G*)) subject to the condition that 0<G*<1, and the offered traffic is estimated as $\Delta = C/(1-G^*)$ in the time interval (a,b).

20. The computer executable code of claim 14 where G* is found using numerical methods, and the Erlang-B formula is computed using the following recursion formula:

$$\text{Erlang}(B, \Delta) = \Delta\text{Erlang}(B-1,\Delta) \,/(B+\Delta\ \text{Erlang}(B-1,\Delta)),$$

with the initial condition set such that Erlang(0,Δ) = 1.

21. A system for continuously monitoring voice over internet protocol grade of service and offered traffic at the gateways in an internet protocol telecom network, where said gateways have a dial-control management information base, said system comprising:

a network management system; and

a computer on which the network management system runs, where on each gateway poll the network management system:

time stamps the retrieved polled dial peer traffic statistics; and

writes the raw data to a file on the computer,

where the system utilizes the method of claim 1 to estimate the voice over internet protocol grade of service and offered traffic at the gateways in the network, and provides the estimated grade of service and

offered traffic as a function of time for a number of data points N throughout the day, where N is 24/T, where T is the period of polling, in hours, for dial peer traffic statistics.

22. A system for continuously monitoring voice over internet protocol grade of service and offered traffic at the gateways in an internet protocol telecom network, where said gateways have a dial-control management information base, said system comprising:

a network management system; and

a computer on which the network management system runs, where on each gateway poll the network management system:

time stamps the retrieved polled dial peer traffic statistics; and

writes the raw data to a file on the computer,

where the system utilizes the method of claim 2 to estimate the voice over internet protocol grade of service and offered traffic at the gateways in the network, and provides the estimated grade of service and offered traffic as a function of time for a number of data points N throughout the day, where N is 24/T, where T is the period of polling, in hours, for dial peer traffic statistics.

23. A system for continuously monitoring voice over internet protocol grade of service and offered traffic at the gateways in an internet protocol telecom network, where said gateways have a dial-control management information base, said system comprising:

a network management system; and

a computer on which the network management system runs, where on each gateway poll the network management system:

time stamps the retrieved polled dial peer traffic statistics; and

writes the raw data to a file on the computer,

where the system utilizes the method of claim 3 to estimate the voice over internet protocol grade of service and offered traffic at the gateways in the network, and provides the estimated grade of service and offered traffic as a function of time for a number of data points N throughout the day, where N is 24/T, where T is the period of polling, in hours, for dial peer traffic statistics.

24. A system for continuously monitoring voice over internet protocol grade of service and offered traffic at the gateways in an internet protocol telecom network, where said gateways have a dial-control management information base, said system comprising:

a network management system; and

a computer on which the network management system runs, where on each gateway poll the network management system:

time stamps the retrieved polled dial peer traffic statistics; and

writes the raw data to a file on the computer, where the system utilizes the method of claim 4 to estimate the voice over internet protocol

grade of service and offered traffic at the gateways in the network, and provides the estimated grade of service and offered traffic as a function of time for a number of data points N throughout the day, where N is 24/T, where T is the period of polling, in hours, for dial peer traffic statistics.

25. A system for continuously monitoring voice over internet protocol grade of service and offered traffic at the gateways in an internet protocol telecom network, where said gateways have a dial-control management information base, said system comprising:

a network management system; and

a computer on which the network management system runs, where on each gateway poll the network management system:

time stamps the retrieved polled dial peer traffic statistics; and

writes the raw data to a file on the computer,

where the system utilizes the method of claim 5 to estimate the voice over internet protocol grade of service and offered traffic at the gateways in the network, and provides the estimated grade of service and offered traffic as a function of time for a number of data points N throughout the day, where N is 24/T, where T is the period of polling, in hours, for dial peer traffic statistics.

26. A system for continuously monitoring voice over internet protocol grade of service and offered traffic at the gateways in an internet

protocol telecom network, where said gateways have a dial-control management information base, said system comprising:

a network management system; and

a computer on which the network management system runs, where on each gateway poll the network management system:

time stamps the retrieved polled dial peer traffic statistics; and

writes the raw data to a file on the computer,

where the system utilizes the method of claim 6 to estimate the voice over internet protocol grade of service and offered traffic at the gateways in the network, and provides the estimated grade of service and offered traffic as a function of time for a number of data points N throughout the day, where N is 24/T, where T is the period of polling, in hours, for dial peer traffic statistics.

27. A system for continuously monitoring voice over internet protocol grade of service and offered traffic at the gateways in an internet protocol telecom network, where said gateways have a dial-control management information base, said system comprising:

a network management system; and

a computer on which the network management system runs, where on each gateway poll the network management system:

time stamps the retrieved polled dial peer traffic statistics; and

writes the raw data to a file on the computer,

where the system utilizes the method of claim 7 to estimate the voice over internet protocol grade of service and offered traffic at the gateways in the network, and provides the estimated grade of service and offered traffic as a function of time for a number of data points N throughout the day, where N is 24/T, where T is the period of polling, in hours, for dial peer traffic statistics.

28. The system of any of claims 21-27, where there is additionally provided a web page interface where the reports on gateway measures as a function of time of day can be disseminated.

29. A system for estimating the grade of service (GoS) and offered traffic for voice over internet protocol (VoIP) calls at a gateway bridging calls between a public switched telephone network and an internet protocol network, the gateway having a dial-control management information base, the system comprising:

means for periodically polling a dial-control management information base for dial peer traffic statistics;

means for storing the polled data;

first estimating means for estimating the carried traffic using the polled data;

second estimating means for estimating the grade of service by utilizing the Erlang-B formula in an inverse manner, operating on the estimated carried traffic obtained by the first estimating means; and

third estimating means for estimating the offered traffic using the estimated values for the carried traffic and the grade of service obtained by the first estimating means and the second estimating means.